

Chapter 11 - Day3

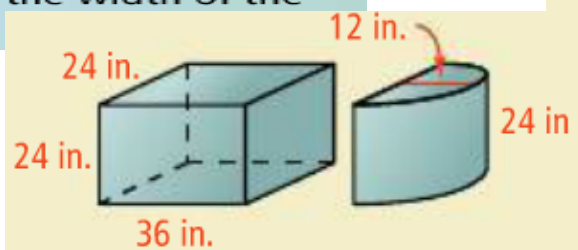
Surface Area & Volume

Lesson objectives: to discover the properties of surface area and volume and how to apply those properties to solve problems.

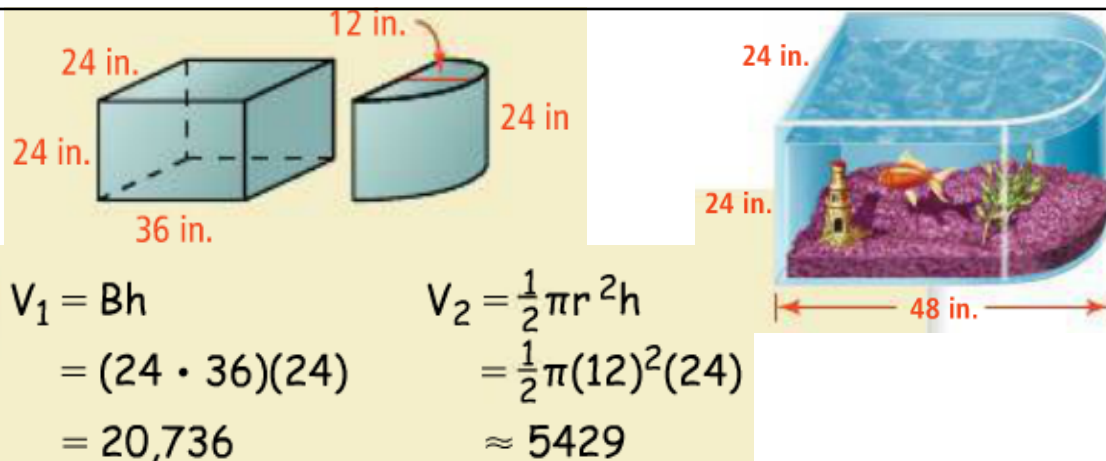
Apr 7-1:59 PM

A **composite space figure** is a three-dimensional figure that is the combination of two or more simpler figures. You can find the volume of a composite space figure by adding the volumes of the figures that are combined.

The length of the prism is the total length minus the radius of the cylinder. The radius of the cylinder is half the width of the prism.



Apr 4-11:18 PM



$$V_1 = Bh$$

$$= (24 \cdot 36)(24)$$

$$= 20,736$$

$$V_2 = \frac{1}{2}\pi r^2 h$$

$$= \frac{1}{2}\pi(12)^2(24)$$

$$\approx 5429$$

$$20,736 + 5429 = 26,165$$

The approximate volume of the aquarium is 26,165 in.³.

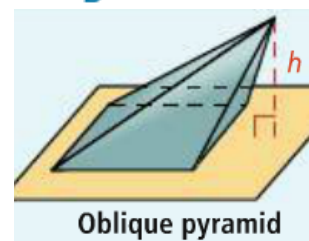
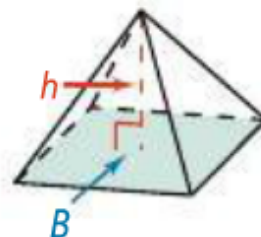
Apr 4-11:18 PM

Theorem 11-8 Volume of a Pyramid

The volume of a pyramid is one third the product of the area of the base and the height of the pyramid.

$$V = \frac{1}{3} Bh$$

This formula works for *any* pyramid, whether right or oblique.



Apr 4-11:25 PM

Architecture The entrance to the Louvre Museum in Paris, France, is a square pyramid with a height of 21.64 m. What is the approximate volume of the Louvre Pyramid?

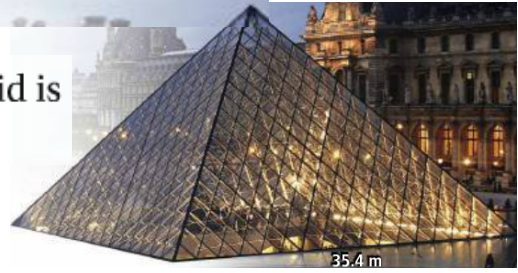
The area of the base of the pyramid is $35.4 \text{ m} \cdot 35.4 \text{ m}$, or 1253.16 m^2 .

$$V = \frac{1}{3} Bh$$

$$= \frac{1}{3} (1253.16) (21.64)$$

$$= 9039.4608$$

The volume is about 9039 m^3



Apr 5-8:21 PM

What is the volume in cubic feet of a square pyramid with base edges 40 ft and slant height 25 ft?

Step 1 Find the height of the pyramid.

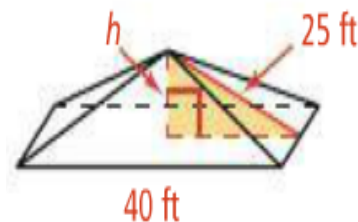
$$c^2 = a^2 + b^2 \quad \text{Use the Pythagorean Theorem.}$$

$$25^2 = h^2 + 20^2 \quad \text{Substitute 25 for } c, h \text{ for } a, \text{ and } \frac{40}{2}, \text{ or } 20, \text{ for } b.$$

$$625 = h^2 + 400 \quad \text{Simplify.}$$

$$h^2 = 225 \quad \text{Solve for } h^2.$$

$$h = 15 \quad \text{Take the positive square root of both sides.}$$



Apr 5-8:26 PM

What is the volume in cubic feet of a square pyramid with base edges 40 ft and slant height 25 ft?

Step 2 Find the volume of the pyramid.

$$V = \frac{1}{3} Bh$$

Use the formula for volume of a pyramid.

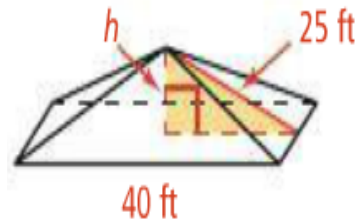
$$= \frac{1}{3}(40 \cdot 40)(15)$$

Substitute $40 \cdot 40$ for B and 15 for h .

$$= 8000$$

Simplify.

The volume of the pyramid is 8000 ft^3 .

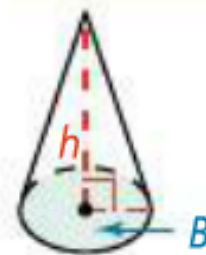


Apr 5-8:26 PM

Theorem 11-9 Volume of a Cone

The volume of a cone is one third the product of the area of the base and the height of the cone.

$$V = \frac{1}{3} Bh \text{ (or) } V = \frac{1}{3} \pi r^2 h$$



Apr 5-8:30 PM

Traditional Architecture The covering on a tepee rests on poles that come together like concurrent lines. The resulting structure approximates a cone. If the tepee pictured is 12 ft high with a base diameter of 14 ft, what is its approximate volume?



$$V = \frac{1}{3}\pi r^2 h$$
 Use the formula for the volume of a cone.

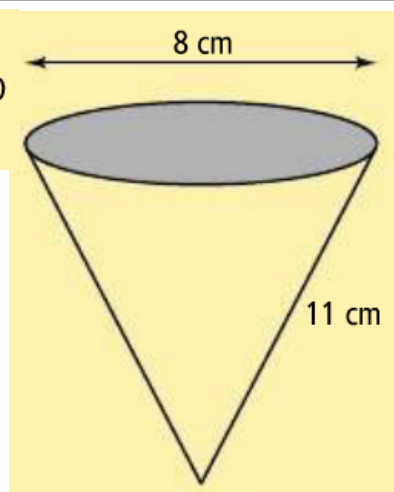
$$= \frac{1}{3}\pi (7)^2 (12)$$
 Substitute $\frac{14}{2}$, or 7, for r and 12 for h .

$$\approx 615.7521601$$
 Use a calculator.

The volume of the tepee is approximately 616 ft³.

Apr 5-8:33 PM

About how many cubic centimeters of water does the paper drinking cup hold?



$$V = \frac{1}{3} B h$$

$$V = \frac{1}{3} \pi r^2 h$$

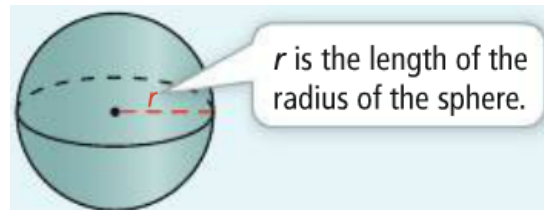
$$V = \frac{1}{3} (3.14)(16)(11)$$

$$V \approx 184 \text{ cm}^3$$

Apr 5-8:35 PM

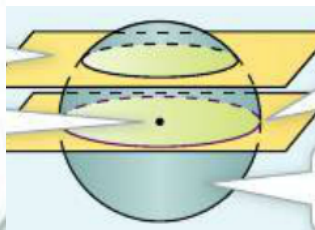
Spheres

A **sphere** is the set of all points in space equidistant from a given point called the **center**. A **radius** is a segment that has one endpoint at the center and the other endpoint on the sphere. A **diameter** is a segment passing through the center with endpoints on the sphere.



Apr 5-8:44 PM

When a plane and a sphere intersect in more than one point, the intersection is a circle. If the center of the circle is also the center of the sphere, it is called a **great circle**.



The circumference of a great circle is the **circumference** of the sphere.

A great circle divides a sphere into two **hemispheres**.

Apr 5-8:48 PM

Theorem 11-10 Surface Area of a Sphere

The surface area of a sphere is four times the product of π and the square of the radius of the sphere.

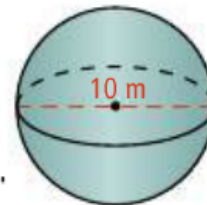


$$SA = 4\pi r^2$$

Apr 5-8:50 PM

What is the surface area of the sphere in terms of π ?

The diameter is 10 m, so the radius is $\frac{10}{2}$ m, or 5 m.



S.A. = $4\pi r^2$ Use the formula for surface area of a sphere.

= $4\pi(5)^2$ Substitute 5 for r .

= 100π Simplify.

The surface area is $100\pi \text{ m}^2$.

Apr 5-8:53 PM

Geography Earth's equator is about 24,902 mi long. What is the approximate surface area of Earth? Round to the nearest thousand square miles.

Step 1 Find the radius of Earth.

$$C = 2\pi r \quad \text{Use the formula for circumference.}$$

$$24,902 = 2\pi r \quad \text{Substitute 24,902 for } C.$$

$$\frac{24,902}{2\pi} = r \quad \text{Divide each side by } 2\pi.$$

$$r \approx 3963.276393 \quad \text{Use a calculator.}$$

Apr 5-8:56 PM

Geography Earth's equator is about 24,902 mi long. What is the approximate surface area of Earth? Round to the nearest thousand square miles.

Step 2 Use the radius to find the surface area of Earth.

$$SA = 4\pi r^2$$

$$SA = 4(3.14159)(3963.3)^2$$

$$SA \approx 197,387,000$$

The surface area of Earth is about 197,387,000 mi².

Apr 5-8:56 PM

Theorem 11-11 Volume of a Sphere

The volume of a sphere is four thirds the product of π and the cube of the radius of the sphere.



$$V = \frac{4}{3} \pi r^3$$

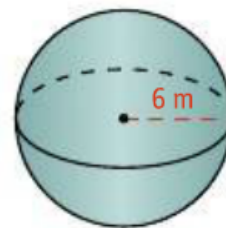
Apr 5-9:04 PM

What is the volume of the sphere in terms of π ?

$$V = \frac{4}{3} \pi r^3 \quad \text{Use the formula for volume of a sphere.}$$

$$= \frac{4}{3} \pi (6)^3 \quad \text{Substitute.}$$

$$= 288 \pi$$



The volume of the sphere is $288\pi \text{ m}^3$.

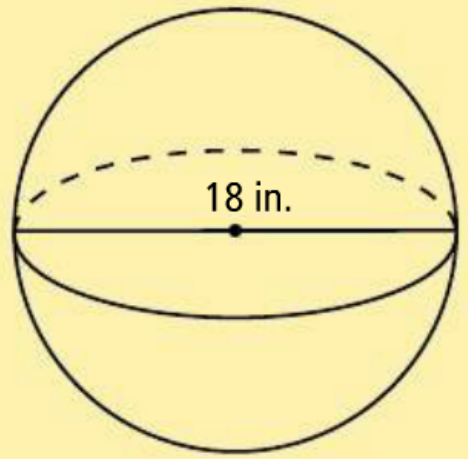
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What is the surface area of the sphere in terms of π ?

$$V = 4\pi r^2$$

$$V = 4\pi(9)^2$$

$$V = 324\pi \text{ in}^2$$



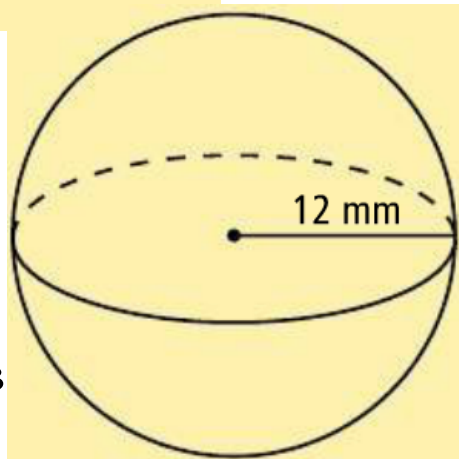
Apr 5-9:09 PM

What is the volume of the sphere in terms of π ?

$$V = \frac{4}{3}\pi r^3$$

$$V = \frac{4}{3}\pi(12)^3$$

$$V = 2304\pi \text{ mm}^3$$



Apr 5-9:13 PM

Voilà!

C'est Fini!

Apr 5-9:15 PM